CERTIFICATE OF TRANSMISSION BY FACSIMILE (37 CFR 1.8) Applicant(s): Bruce B. Fitts, et al.			Docket No. RGP-0072
Serial No. 10/053,346	Filing Date 01/18/2002	Examiner Hoa Van Le	Group Art Unit 1752

Invention: Apparatus And Method For Electrochemical Cell Components

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TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT (Under 37 CFR 1.97(b) or 1.97(c))	Docket No. **RGP-0072**

In Re Application Of: **Bruce B. Fitts, et al.**

Serial No.	Filing Date	Examiner	Group Art Unit
10/053,346	**01/18/2002**	**Hoa Van Le**	**1752**

Title: **Apparatus And Method For Electrochemical Cell Components**

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

37 CFR 1.97(b)

1. ☐ The Information Disclosure Statement submitted herewith is being filed within three months of the filing of a national application other than a continued prosecution application under 37 CFR 1.53(d); within three months of the date of entry of the national stage as set forth in 37 CFR 1.491 in an international application; before the mailing of a first Office Action on the merits, or before the mailing of a first Office Action after the filing of a request for continued examination under 37 CFR 1.114.

37 CFR 1.97(c)

2. ☒ The Information Disclosure Statement submitted herewith is being filed after the period specified in 37 CFR 1.97(b), provided that the Information Disclosure Statement is filed before the mailing date of a Final Action under 37 CFR 1.113, a Notice of Allowance under 37 CFR 1.311, or an Action that otherwise closes prosecution in the application, and is accompanied by one of:

   ☒ the statement specified in 37 CFR 1.97(e);

   OR

   ☐ the fee set forth in 37 CFR 1.17(p).

TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT (Under 37 CFR 1.97(b) or 1.97(c))	Docket No. RGP-0072

In Re Application: **Bruce B. Fitts, et al.**

Serial No.	Filing Date	Examiner	Group Art Unit
10/053,346	01/18/2002	Hoa Van Le	1752

Apparatus And Method For Electrochemical Cell Components

Payment of Fee

(Only complete if Applicant elects to pay the fee set forth in 37 CFR 1.17(p))

☐ A check in the amount of is attached.

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P10A/REV02

STATEMENT UNDER 37 CFR 1.97(e) ACCOMPANYING INFORMATION DISCLOSURE STATEMENT	Docket No. RGP-0072

In Re Application Of: **Bruce B. Fitts et al.**

Serial No.	Filing Date	Examiner	Group Art Unit
10/053,346	**01/18/2002**	**Hoa Van Le**	**1752**

Invention: **Apparatus And Method For Electrochemical Cell Components**

TO THE COMMISSIONER FOR PATENTS:

This is a statement under the provisions of 37 CFR 1.97(e) in the above-identified application.

Check applicable statement herebelow:

Statement Under 37 CFR 1.97(e)(1)

☐ Each item of information contained in the accompanying Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the Information Disclosure Statement.

Statement Under 37 CFR 1.97(e)(2)

☒ No item of information contained in the accompanying Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the undersigned person, after making reasonable inquiry, no item of information contained in the accompanying Information Disclosure Statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the Information Disclosure Statement.

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Dated: **April 15, 2004**

Leah M. Reimer
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P4??/REV02

RGP-0072

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Bruce B. Fitts, et al.

Serial No.: 10/053,346

Filing Date: 01/18/2002

For: APPARATUS AND METHOD FOR ELECTROCHEMICAL CELL COMPONENTS

Group Art Unit: 1752

Examiner: Hoa Van Le

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §§ 1.56, 1.97 AND 1.98

VIA FACSIMILE (703) 872-9306
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

In compliance with the duty to disclose, submitted herewith is form PTO-A820 (PTO-1449) identifying translations of JP 61296067 and JP 62138549. These translations themselves were not cited in a counterpart foreign application, nor known to any individual designated in 37 C.F.R. 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. It is accordingly believed that no fee is due under 36 C.F.R. § 1.17(p). Copies of the translations are enclosed.

The filing of this Information Disclosure Statement shall not be construed as a representation that a search has been made, or an admission that the information cited is, or is considered to be, material to patentability.

Respectfully submitted,

CANTOR COLBURN LLP

By:______________________
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INFORMATION DISCLOSURE CITATION (Use several sheets if necessary)	Docket Number (Optional) RGP-0072	Application Number 10/053,346
	Applicant(s) Bruce B. Fitts, et al.	
	Filing Date 01/18/2002	Group Art Unit 1752

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

FOREIGN PATENT DOCUMENTS

	REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation YES	Translation NO
		JP 61296067	12/26/1986	Japan			✓	
		JP 62138549	06/22/1987	Japan			✓	

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

TRANSLATION:

(19) Japanese Patent Office (JP) (11) Kokai No.: 61[1986]-296,067

(12) Kokai Patent Gazette (A) (43) Kokai Date: December 26, 1986

EARLY DISCLOSURE
[Unexamined Patent Application]

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C 08 K 7/06	CAH	6845-4J
H 01 B 1/22		8222-5E

No Examination Requested Number of Inventions: 1 (total: 3 pages)

Title of the Invention:

CONDUCTIVE RESIN COMPOSITION

(21) Application No.: 60[1985]-136,102

(22) Application Date: June 24, 1985

(72) Inventor: H. Iwase
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SPECIFICATION

1. Title of the Invention:

CONDUCTIVE RESIN COMPOSITION

2. Scope of the Patent Claim(s):

1. A conductive resin composition characterized in that 1–10 weight% of

SUS304 stainless steel fiber is incorporated as a conductive filler in a synthetic resin.

2. The conductive resin composition of Claim 1, wherein the SUS304 stainless steel fiber has a composition consisting of up to 0.08% carbon, up to 1.00% silicon, up to 2.00% manganese, up to 0.045% phosphorus, up to 0.030% sulfur, 8.00–10.50% nickel, 18.00–20.00% chromium, with the remainder consisting of iron.

3. Detailed Description of the Invention

Technical Field of the Invention

The present invention pertains to conductive resin compositions with excellent conductivity containing SUS304 stainless steel fiber.

Technical Background of the Invention and Attendant Problems

In the past, one or more of carbon powder, carbon fiber, metal powder, and metal fiber have been used to provide conductivity, when a conductive resin was to be obtained by adding and mix-kneading a conductive filler in a synthetic resin. However, carbon powder and carbon fiber are not good enough to yield a high conductivity of 10^{-1} Ω-cm or less in terms of volume resistivity, and the mix-kneading of a metal powder had the drawback that high conductivity could not be provided unless 60 weight% or more, based on the weight of the resin, of the metal power was incorporated. Furthermore, when the metal fiber is copper or brass fiber with thick filament diameters, 30 weight% or more of the fiber must be added, which presents a problem in that the specific gravity is increased. Moreover, if SUS316 stainless steel fiber with thin filament diameters is incorporated, the viscosity of the resin increases, or the fiber gets severed by the mechanical kneading process during the production stage of a resin composition and predetermined

conductivity cannot be provided, thus there has been problem in that 15 weight% or more of the fiber has to be incorporated.

Object of the Invention

The present invention was developed to solve the problems of the above-mentioned conventional techniques; thus, the object of the present invention is to provide a conductive resin composition with a lower filler content, excellent conductivity, lower specific gravity, and low cost.

Abstract of the Invention

The present inventor carried out extensive studies to achieve the above-mentioned objectives, and found that a resin composition with excellent conductivity, low specific gravity, and low cost can be obtained if a predetermined amount of SUS304 stainless steel fiber is used as the filler. It was this finding that led to the development of the present invention.

Specifically, the present invention comprises a conductive resin composition characterized in that 1–10 weight% of SUS304 stainless steel fiber is incorporated as a conductive filler in a synthetic resin. And the SUS304 stainless steel fiber itself has a composition consisting of up to 0.08% carbon, up to 1.00% silicon, up to 2.00% manganese, up to 0.045% phosphorus, up to 0.030% sulfur, 8.00–10.50% nickel, 18.00–20.00% chromium, with the remainder consisting of iron.

The synthetic resin to be used in the present invention can be selected from among polystyrene resins, ABS resins, polycarbonate resins, polybutadiene resins, modified PPO

resins, polybutylene terephthalate resins, unsaturated polyester resins, phenolic resins, and epoxy resins, and these are used singly or in combinations of two or more.

The stainless steel fiber to be used as a conductive filler in the present invention is made of a material called SUS304, and consists of a bundle of 1,000–15,000 filaments 6–15 μm in diameter. If the filament diameter is less than 6 μm, the viscosity of the resin rises, and when it is greater than 15 μm the cost increases, which is undesirable. The SUS304 stainless steel fiber has a composition consisting of up to 0.08% carbon, up to 1.00% silicon, up to 2.00% manganese, up to 0.045% phosphorus, up to 0.030% sulfur, 8.00–10.50% nickel, 18.00–20.00% chromium, with the remainder consisting of iron, and contains more chromium and less nickel than ordinary SUS316 stainless steel, and contains no molybdenum at all. Therefore, this fiber is a little harder than fiber of SUS316, and has the property of very little bending and breakage of the fiber. Furthermore, this fiber is weakly magnetic, whereas SUS316 is nonmagnetic. It is desirable for the incorporated amount of SUS304 stainless steel fiber to be 1–10 weight% based on the weight of the resin composition. When the amount incorporated is less than 1 weight%, the fiber is not effective in imparting conductivity, and with more than 10 weight%, the specific gravity increases and so does the cost, which is undesirable. Accordingly, the content should be limited within said range.

For producing a conductive resin composition with the use of a synthetic resin and SUS304 stainless steal fiber, the synthetic resin and stainless steel fiber are heated and mix-kneaded, as is usually done. The conductive resin composition of the present invention can be combined with other additives -- if needed -- without thereby impairing the effect of the present invention. The conductive resin composition thus obtained can

be used for electromagnetic wave shielding molded articles for electronic instruments, etc.

ACTUAL EXAMPLES OF THE INVENTION

The present invention will now be illustrated by actual examples, however, it should be understood that the present invention is not limited by these actual examples in any way.

Actual Examples 1–2

Conductive resin compositions were produced by using compositions as shown in Table 1, binding a bundle of 6,000 SUS304 stainless steel filament fibers 8 μm in diameter with polyethylene terephthalate, cutting the bundle into 5-mm long strands, and heating and mix-kneading the chopped strands with a polystyrene resin. These compositions were injection molded to obtain molded articles, and their volume resistivity and specific gravity were tested; the results are shown in Table 1. The conductive resin compositions of the present invention had small volume resistivities and small specific gravities; thus, the effect of the present invention was achieved.

Comparison Example

A conductive resin composition was produced in a manner similar to that of Actual Examples 1–2 by using a composition as shown in Table 1, binding a bundle of 6,000 SUS316 stainless steel filament fibers 8 μm in diameter with polyethylene

terephthalate, and cutting the bundle into 5-mm long strands. This conductive resin composition was then injection molded in a manner similar to that of Actual Examples 1–2 to obtain a molded article, which was tested in a manner similar to that of said Actual Examples. The results are shown in Table 1.

(a) (単位)

(c) 例 / (b) 項目	(d) 実施例 1	実施例 2	比較例 (e)
(f) 組成（重量部）			
(g) ポリスチレン樹脂	90	97	85
(h) 導電性充填材*1			
(i) SUS304ステンレス繊維	10	3	–
(j) SUS316ステンレス繊維	–	–	15
(k) 特性			
(l) 体積抵抗率（Ω・cm）	7.6×10^{-3}	9.1×10^{-2}	8.0×10^{-2}
(m) 比重	1.15	1.08	1.21

(n) *1：線径 8μm、長さ5mm の繊維

Table 1. KEY: (a) (unit); (b) item; (c) example; (d) Actual Example; (e) Comparison Example; (f) composition (parts by weight); (g) polystyrene resin; (h) conductive filler *1; (i) SUS304 stainless steel fiber; (j) SUS316 stainless steel fiber; (k) characteristics; (l) volume resistivity (Ω-cm); (m) specific gravity; and (n) *1: fiber with a filament diameter of 8 μm and a length of 5 mm.

Effect of the Invention

The conductive resin compositions of the present invention can yield molded articles with excellent conductivity in spite of low filler contents, and with low specific gravities, and low cost, by incorporating predetermined amounts of SUS304 stainless steel fiber. The viscosity of the resin did not rise and the specific gravity did not increase, because the amount of stainless steel incorporated was small; in addition, the fiber did not break by mechanical mix-kneading, and excellent conductivity was exhibited.

TRANSLATION:

(19) Japanese Patent Office (JP) (11) Kokai No.: 62[1987]-138,549

(12) Kokai Patent Gazette (A) (43) Kokai Date: June 22, 1987

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No Examination Requested Number of Inventions: 1 (total: 6 pages)

(54) Title of the Invention:

CONDUCTIVE POLYMER COMPOSITION

(21) Application No.: 60[1985]-277,922

(22) Application Date: December 12, 1985

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(71) Applicant: Idemitsu Petrochemical Co., Ltd.
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(74) Authorized Agent: F. Kubota, Patent Attorney

SPECIFICATION

1. Title of the Invention:

CONDUCTIVE POLYMER COMPOSITION

2. Scope of the Patent Claim(s):

1. A conductive polymer composition consisting of a liquid diene-based polymer that

contains one of hydroxyl groups, carboxyl groups, acryloyl groups, and methacryloyl groups, a radical generator, and a conductive material.

2. The composition described in Claim 1, wherein the liquid diene-based polymer is a liquid diene-based polymer that contains one of hydroxyl groups, carboxyl groups, acryloyl groups, and methacryloyl groups at the terminals of the molecule.

3. The composition as described in Claim 1, wherein the amount of the radical generator added is 0.1–30 parts by weight per 100 parts by weight of the liquid diene-based polymer.

4. The composition as described in Claim 1, wherein the radical generator is benzoyl peroxide or dicumyl peroxide.

5. The composition as described in Claim 1, wherein the conductive material is a material selected from among metal powder, metal fiber, metal oxides, metal-coated fiber, carbon powder, carbon fiber, and mixed conductive materials of metals or metal oxides and other conductive materials.

3. Detailed Description of the Invention

<u>Area of Industrial Application</u>

The present invention pertains to conductive polymer compositions and, in more detail, to conductive polymer compositions that can be produced with ease and moreover provide elastic cured materials having excellent conductivity.

<u>Prior Art and Problems to be Solved by the Invention</u>

Thus far, a form of conductive rubber is known that is prepared by adding conductive materials such as metals, metal oxides, or metal halides to natural rubber or synthetic rubber.

However, there have been various problems with producing this conductive rubber. In other words, it is difficult to add and disperse the conductive material uniformly in natural rubber or synthetic rubber at ordinary temperatures, because the rubber is solid at ordinary temperatures; thus, to add and disperse the conductive material uniformly, the rubber has to be heated to relatively high temperatures and then the mixture has to be intensively mix-kneaded by applying a high torque. Furthermore, the following method has been employed, depending on the type of conductive material used, to incorporate the conductive material, namely, placing the rubber in a sealed vessel, feeding the conductive material into the vessel under reduced pressure, and diffusing it. However, certain aspects of this process are inconvenient, such as the fact that special equipment is required, a complicated procedure is involved, and considerable time is required for the incorporation.

An Approach to Solving the Problems

The present inventor carried out extensive studies to solve the above-mentioned problems, and found that a liquid polymer composition that can be produced with ease, and moreover that provides an elastic cured material having excellent conductivity, can be obtained by using three ingredients, i.e., a specified liquid diene-based polymer, a radical generator, and a conductive material, in combination. It was this finding that led to the development of the present invention.

Specifically, the present invention provides a conductive polymer composition consisting of a liquid diene-based polymer having one of hydroxyl groups, carboxyl groups, acryloyl groups, and methacryloyl groups, a radical generator, and a conductive material.

The liquid diene-based polymer to be used in the present invention is a liquid diene-based

polymer having one of hydroxyl groups, carboxyl groups, acryloyl groups, and methacryloyl groups within the molecule or at the terminals of the molecule. Such liquid diene-based polymers include polymers and copolymers of dienes with 4–12 carbon atoms, and moreover copolymers of these diene monomers with α-olefinic addition-polymerizable monomers with 2–22 carbon atoms.

Liquid diene-based polymers with hydroxyl groups that can be used are usually those with number-average molecular weights of 300–25,000, and preferably 500–10,000, and hydroxyl group contents of 0.1–10 mEq/g, and preferably 0.3–7 mEq/g. Specific examples include butadiene homopolymers, isoprene homopolymers, butadiene-styrene copolymers, butadiene-isoprene copolymers, butadiene-acrylonitrile copolymers, butadiene-2-ethylhexylacrylate copolymers, and butadiene-*n*-octadecylacrylate copolymers. These liquid diene-based polymers with hydroxyl groups can be produced, for example, by reacting conjugated diene monomers in the presence of hydrogen peroxide in a liquid reaction medium with heating.

Examples of liquid diene-based polymers with carboxyl groups are those represented by the following formula (I), and those with carboxyl groups at the terminals of the molecule are preferred. Liquid diene-based polymers with carboxyl groups can be produced, for example, by reacting conjugated diene monomers with maleic anhydride, etc.

Examples of liquid diene-based polymers with acryloyl groups are those represented by the following formula (II), and those with acryloyl groups at the terminals of the molecule are preferred. Liquid diene-based polymers with acryloyl groups can be produced, for example, by reacting the aforementioned liquid diene-based polymers with hydroxyl groups with acrylic acid,

etc.

Examples of liquid diene-based polymers with methacryloyl groups are those represented by the following formula (III), and those with methacryloyl groups at the terminals of the molecule are preferred. Liquid diene-based polymers with methacryloyl groups can be produced, for example, by reacting the aforementioned liquid diene-based polymers with hydroxyl groups with methacrylic acid, etc.

One of these liquid diene-based polymers with hydroxyl groups, carboxyl groups, acryloyl groups, or methacryloyl groups is usually used singly, but combinations of two or more can also be used.

$$HOOC\text{-}(CH_2-CH=CH-CH_2)_n\text{-}COOH \quad \cdots (I)$$

(In the formula, n represents an integer of 4–500, and preferably 8–200.)

$$CH_2=CH-\underset{\underset{O}{\|}}{C}-O-(CH_2-CH=CH-CH_2)_n-O-\underset{\underset{O}{\|}}{C}-CH=CH_2 \quad \cdots (II)$$

(In the formula, n represents an integer of 4–500, and preferably 8–200.)

$$CH_2=\overset{\overset{CH_3}{|}}{C}-\underset{\underset{O}{\|}}{C}-O-(CH_2-CH=CH-CH_2)_n-O-\underset{\underset{O}{\|}}{C}-\overset{\overset{CH_3}{|}}{C}=CH_2 \quad \cdots (III)$$

(In the formula, n represents an integer of 4–500, and preferably 8–200.)

The radical generator to be used in the present invention is not particularly critical, and can be selected randomly from among the known ones. Examples of those usually used include benzoin, benzoyl methyl ether, benzophenone, benzoyl peroxide, lauryl peroxide, dicumyl peroxide, methyl ethyl ketone peroxide, and azobisisobutyronitrile. The amount usually added is 0.1–30 parts by weight per 100 parts by weight of the aforesaid liquid diene-based polymer, and preferably 1–10 parts by weight. The addition of a radical generator to the aforesaid liquid

diene-based polymer brings about the formation of an effective three-dimensional structure.

The conductive material to be used in the present invention can be selected randomly from among the known ones, upon consideration of the intended use of the conductive polymer composition to be produced. Specific examples of typically used conductive materials are carbon black, graphite, carbon powder, carbon fiber, etc.; metals (powder, fiber, etc.) such as silver, copper, nickel, aluminum, and alloys; metal oxides (powder, fiber, etc.) such as stannic oxide, zinc oxide, and titanium oxide; combinations of metal-coated glass beads and glass fiber; metal halides such as cuprous iodide; and mixed conductive materials consisting of metals or metal oxides and other conductive materials. These may be used singly or in combinations of two or more. The amount of these conductive materials to be added is not particularly critical, but suitable amounts are usually 3–1,000 parts by weight, and preferably 5–700 parts by weight, per 100 parts by weight of the aforesaid liquid diene-based polymer.

The present invention is made up in principle of the above-mentioned three ingredients, but other additives can be added, if necessary, without thereby greatly impairing the object of the present invention. For example, multifunctional acrylates such as trifunctional oligoester acrylate, pentaerythritol triacrylate, trimethylolpropane triacrylate, hydroxypivalic acid neopentyl glycol diacrylate, and 1,6-hexanediol diacrylate, or unifunctional acrylates such as 2-ethylhexyl acrylate, tetrahydrofurfuryl acrylate, and cyclohexyl acrylate can be added as reactive diluents. In addition, fillers such as mica, vermiculite, calcium carbonate, and slate powder; plasticizers such as dioctyl phthalate as a viscosity modifier; softening agents such as aromatic, naphthenic, and paraffinic oils can be added; or tackifiers such as alkylphenol resins, terpene resins, terpenephenol resins, xylenol formaldehyde resins, rosin, hydrogenated rosin, cumarone resins,

and aliphatic and aromatic petroleum resins can also be added to adjust the stickiness and adhesiveness. Furthermore, antioxidants can be added to enhance weatherability, or silicon compounds can be added as antifoam agents.

The conductive polymer composition of the present invention is produced by combining and mix-kneading the above-mentioned ingredients. Mix-kneading conditions can be determined with consideration of the types, mixing proportions, etc., of the source materials to be used, but the mixture is stirred usually at 0–200°C, and preferably at 10–100°C, for 0.1–1,000 minutes, and preferably for 1–200 minutes. The conductive polymer composition of the present invention thus obtained is liquid, which can then be turned into a conductive elastic cured material when cured at 20–250°C, and preferably at 50–200°C, for 0.1–168 hours, and preferably for 0.5–75 hours.

Effect of the Invention

The conductive polymer composition of the present invention can be produced with great ease, because combining specified materials as source materials eliminates the need for heating to high temperatures at the time of production, the need for mix-kneading under high torque, and the need for special equipment. In other words, a conductive material can be added and dispersed uniformly in the composition by a simple operation involving mixing at temperatures of around room temperature.

Furthermore, the composition of the present invention is liquid, and hence can be cured and formed easily into the desired shape.

Moreover, a conductive elastic cured material that can be obtained by curing the composition of the present invention has excellent conductivity (low volume resistivity).

Accordingly, the conductive polymer composition of the present invention can be used effectively as a pressure-sensitive conductive material, heat generator, conductive coating, conductive adhesive, conductive gasket, electromagnetic shielding material, electric-field relaxation self-fusing tape, coating material, antistatic material, and semiconductive material.

ACTUAL EXAMPLES

Next, the present invention will be illustrated in detail by the use of actual examples.

Actual Examples 1–5

A liquid diene-based polymer, a radical generator, a conductive material, and a reactive diluent (Actual Examples 1, 3, and 4) were mixed in given amounts (parts by weight) at 25°C for 20 minutes as shown in Table 1. The mixture obtained was cured and formed in a press mold under the conditions of a pressure of 100 kgf/cm^2 and a temperature of 160°C for 1 hour to obtain a 2-mm thick sheet. The tensile strength and volume resistivity were measured on the sheets obtained. The results are shown in Table 1.

Table 1. KEY: (a) Actual Example; (b) composition; (c) liquid diene-based polymer; (d) hydroxyl group-terminated liquid polybutadiene*1; (e) carboxyl group-terminated liquid polybutadiene*2; (f) acryloyl group-terminated liquid polybutadiene*3; (g) radical generator; (h) dicumyl peroxide; (i) benzoyl peroxide; (j) conductive material; (k) metal powder*4; (l) metalcoated fiber*5; (m) reactive diluent; (n) vinyltoluene; (o) trimethylol-propane trimethacrylate; (p)cured product; (q) tensile strength (kgf/cm^2)*6; and (r) volume resistivity (Ω-cm).

			(a)実施例				
			1	2	3	4	5
(b)組成物	(c)液状ジエン系重合体	水酸基末端液状ポリブタジエン*1 (d)	80	—	—	—	—
		カルボキシル基末端液状ポリブタジエン*2 (e)	—	100	80	—	—
		アクリロイル基末端液状ポリブタジエン*3 (f)	—	—	—	80	100
	(g)ラジカル発生剤	ジクミルパーオキサイド (h)	4	—	4	2	2
		ベンゾイルパーオキサイド (i)	—	3	—	1	—
	(j)導電性物質	金属粉*4 (k)	300	—	250	—	250
		金属被覆繊維*5 (l)	—	100	50	100	50
	(m)反応性希釈剤	ビニルトルエン (n)	20	—	—	10	—
		トリメチロールプロパントリメタクリレート (o)	—	—	20	10	—
(p)硬化体	(q)引張強度 (kgf/cm^2) *6		93	13	63	73	18
	(r)体積抵抗率 (Ω-cm)		3.8×10^{-3}	6.3×10^{-1}	1.1×10^{-2}	5.2×10^{-3}	7.3×10^{-1}

*1 = Idemitsu Petrochemical (Ltd.); R-45HT; number-average molecular weight = 2,800; OH content = 0.79 mEq/g

*2 = Idemitsu Petrochemical (Ltd.); R-45MA; acid value = 43 mgKOH/g; viscosity = 150 poise/30°C

*3 = Idemitsu Petrochemical (Ltd.); R-45ACR; viscosity = 400 poise/60°C

*4 = Fukuda Kinzoku Hakufun Kogyo (Ltd.); silver-saving conductive composite powder Ni-Ag series; Ag content = 50 weight%; average particle size = 2.45 µm; specific surface area = 250 cm^2/g

*5 = Nippon Sheet Glass (Ltd.); aluminum-coated glass fiber "Alumi Coat Fiber"; filament chopped fiber length = 13 [*unit illegible*]; fiber length = 15 µm

*6 = in accordance with JIS K6301

Comparison Examples 1 and 2

A given amount of natural rubber was masticated, as shown in Table 2. Specifically, the

refining of natural rubber was performed twice at a roll temperature of 55°C and a gap of 0.2 mm, and then a ¾ cut was performed alternately for 30 seconds at a gap of 1.4 mm. After said mastication, stearic acid was added to the natural rubber so as to spread to every part; moreover, carbon black was added, first one-half the amount and then the remaining half was added after the ¾ cut (roll gap 1.6 mm) was carried out once, followed by another ¾ cut (roll gap 1.9 mm). Subsequently, zinc white and sulfur were added to spread to every part, then benzothiazyl disulfide was added, and a ¾ cut (roll gap 0.75 mm) was performed three times. A conductive material as shown in Table 2 was added to this, and a ¾ cut (roll gap 1.9 mm) was performed three times, followed by 6 repetitions of passing between rolls (roll gap 0.75 mm) and further followed by mix-kneading at a roll gap of 2 mm to obtain a sheet product. The sheet product obtained was placed in a mold of 2 × 150 × 300 mm, and treated at 150°C under applied pressure for 1 hour to obtain a vulcanized sheet. The tensile strength and volume resistivity of the sheets produced were then measured. The results are shown in Table 2.

Table 2. KEY: (a) Comparison Example; (b) rubber mix (parts by weight); (c) natural rubber; (d) zinc white; (e) sulfur; (f) stearic acid; (g) benzothiazyl disulfide; (h) carbon black (channel black); (i) conductive material; (j) metal powder*4; (k) metal-coated fiber*5; (l) properties; (m) tensile strength*6 (kgf/cm^2); (n) volume resistivity (Ω-cm); (o) others; (p) fiber was crushed during the mastication; and (q) *4–*6: same as in Table 1.

		(a)比較例 1	(a)比較例 2
(b) ゴム配合物(重量部)	(c)天然ゴム	100	100
	(d)亜鉛華	5	5
	(e)イオウ	3	3
	(f)ステアリン酸	3	3
	(g)ベンゾチアジルジサルファイド	1	1
	(h)カーボンブラック(チャネルブラック)	50	50
(i) 導電物質	(j)金属粉*4	500	—
	(k)金属被覆繊維*5	—	100
(l) 性質	(m)引張強度*6 (kgf/cm^2)	8	14
	(n)体積抵抗率 (Ω・cm)	2.4×10^{3}	6.8×10^{7}
(o)その他		—	(p)素練り中、繊維が破砕された。

(q) *4〜*6…第1表に同じ。